



# Electricity transmission in Canada

Electricity  Électricité  
Canada  Canada

# What is transmission and why is it important?

Electricity transmission is the backbone of Canada's power system. It moves large volumes of high-voltage electricity over long distances.

The journey begins by moving electricity from generation facilities, to distribution utilities, to power local communities, including residential, commercial, institutional, and industrial customers.

## How transmission moves electricity

Canada's transmission network is interconnected. There are major transmission lines crossing interprovincial borders east-west, and across the Canada-United States border.

These interconnections enable robust electricity trade between provinces and with the U.S., supporting local economic development, system flexibility, and stability.

A transmission **intertie** is a high-voltage electrical interconnection that allows the passage of current to be shared between two or more electricity systems. This enables electrons to move from one province to another.

Sharing electricity between jurisdictions improves grid reliability in each province by easing peak-load pressure, and allows for power purchasing at off-peak prices, and clean-energy integration.



**Canadian generation is over 80% non-emitting.**

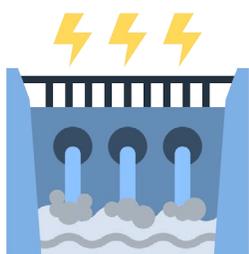


**Canada has over 180,000 km of transmission lines.**



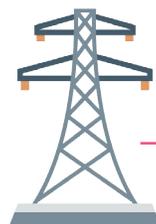
**Canada uses high-voltage alternating current (HVAC) and, in some cases, high-voltage direct current (HVDC) to move power efficiently over long distances.**

## How does electricity get to Canadians?



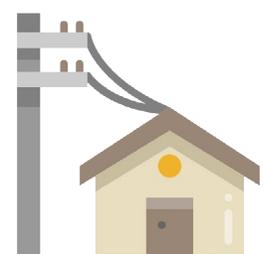
### Generation

Electricity is produced from diverse sources, including hydro, wind, solar, nuclear, and thermal (i.e., coal, oil, natural gas and diesel).



### Transmission

High-voltage transmission lines carry electricity efficiently across provinces and regions. Substations convert electricity to higher voltages for long-distance travel.



### Distribution

At local substations, voltage is reduced so electricity can be safely delivered via distribution networks to homes and businesses.

Type	Typical Voltage Levels	Different Voltage Levels
<b>HVAC</b> (High-voltage alternating current)	66, 69, 115, 138, 230, 500* kV	<ul style="list-style-type: none"> <li>• Lower voltage levels are usually used for short and medium distances</li> <li>• Higher voltage levels are used for bulk electricity transfers over long distances (345 kV and above).</li> </ul>
<b>HVDC</b> (High-voltage direct current)	250, 350, 450, 500, 600-800* kV  *Higher kV = higher efficiency for long-distance transmission.	

## Inter-provincial and international transmission

Inter-provincial and international transmission enables provinces and states to share electricity or “load share” during peak-demand periods, to enhance grid stability and reliability.

Load sharing during alternate peak-demand periods with neighbouring jurisdictions also helps address affordability challenges. Increasing inter-provincial and international transmission could provide a “green corridor” that connects renewable power to regions that are more reliant on fossil fuels.

International powerlines are regulated by the federal government through the Canada Energy Regulator (CER). The North American Electric Reliability Corporation (NERC) also sets mandatory reliability standards for Canada and the U.S., which are enforced by each country’s regulatory authorities.

Canada’s intertie network consists of 20 major connections, evenly split between 10 east-west and 10 north-south interties. The combined transfer capability across the country is approximately 17 GW east-west and 28 GW north-south. Intertie utilization rates – the percentage of transfer capacity that is used on average is high nationwide, averaging 72% for east-west interties and 78% for north-south.

**There are 31 operating U.S.-Canada interties.**



## Intra-provincial transmission

Intra-provincial transmission lines are critical, as they provide electricity to growing urban centres from remote generation sites. Such lines are the responsibility of the provincial government, the independent system operator and the transmission line owners (i.e., crown corporations or investor-held).

## Rights of Way

A right-of-way (ROW) is a built corridor for transmission lines, providing physical space for infrastructure and maintenance access. As Canada accelerates grid expansion to meet increasing demand, ROW acquisition and management have emerged as critical bottlenecks in the development of transmission projects.

### Transmission projects face multiple challenges:

- Complex permitting and regulatory burden from overlapping regulatory frameworks; ;
- Interjurisdictional challenges on benefits and cost sharing;
- Indigenous stewardship considerations over the land require meaningful and often lengthy consultation;
- High capital costs or rental agreements for land acquisition and usage;
- Supply chain constraints and labour shortages.

Rights-of-way are increasingly integrated into community planning to add further value for community members. Dog parks, bike paths, pollinator meadows, and other initiatives have all been integrated into ROWs to increase their value to the neighbourhood.

# Social needs and economics



## Why is new transmission needed?

Due to increasing demand, transmission assets are incredibly important to Canada's energy transition. At the same time, Canada's electricity system is progressing to a low-carbon future, with significant investments in renewable energy and storage.

New and upgraded transmission infrastructure is required to transport electricity from generator facilities to consumers, support decarbonization goals, and strengthen the grid for reliability and affordability.

Canada's electricity grid is aging and requires maintenance or replacement in several jurisdictions. Strengthening interties will provide energy security amongst key provincial partners.

## The role of transmission in reliability and affordability

Transmission networks ensure electricity can be supplied where and when it is needed, even during peak demand or emergencies. Interconnections allow provinces to access the lowest-cost generation available, helping to keep electricity prices stable for Canadians.

Transmission is essential for connecting new renewable energy projects, such as wind and solar farms, to the grid. Transmission also reduces the need for additional generation investment.

## Transmission's economic impact

Transmission projects create jobs and economic opportunities, especially in rural and Indigenous communities. Reliable transmission connections support our communities and help power our hospitals, schools, manufacturing, transportation, trade and much more.

## Cost allocation

Transmission investment costs including construction, operation and maintenance are primarily supported through direct utility borrowing. Once construction is complete and the line is energized, costs are recovered over time through regulated tariffs approved by provincial regulators. (i.e., Ontario Energy Board).

- **In 2024, the electricity industry employed over 110,000 Canadians.**
- **The electricity industry contributes an estimated 2% of Canada's annual GDP. (2024=36 billion CDN)**
- **Every industry needs electricity to operate.**
- **From 1990 to 2024, Canada has been a net exporter of electricity.**
- **In 2024, Canada had \$3.13 billion in revenue with a net export value of \$1.79 billion.**

# Indigenous engagement, environmental protection, and safety



## Indigenous equity partnerships

Transmission owners increasingly recognize the need to build meaningful long-term relationships with Indigenous communities through partnership arrangements. Partnership structures are becoming more commonplace with improved policy tools, access to financial capital, and benefit-sharing frameworks. These help enable transmission projects to move forward while advancing economic reconciliation.

## Environmental impacts

Transmission projects undergo rigorous environmental assessments to minimize impacts on local ecosystems, wildlife, and cultural heritage through the adjustment and safe placement of linear assets and mindful construction practices.

Over 400 km of high voltage transmission lines run through Parks Canada lands. To ensure operational reliability, access is required to inspect, upgrade, and maintain the physical assets and ROWs.

Companies work diligently to ensure that the construction and ongoing operations of transmission corridors comply with all relevant federal and provincial regulations.

## Electric and Magnetic Fields

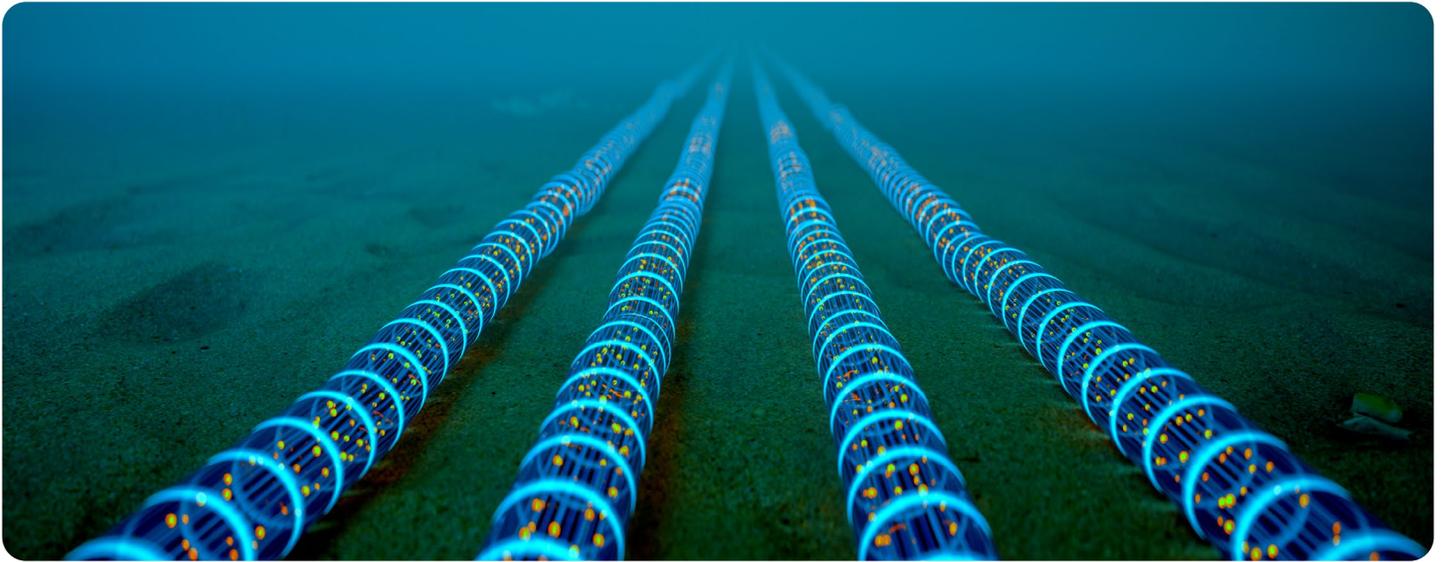
Extremely low frequency (ELF) electric and magnetic fields (EMFs) are present everywhere electricity flows. Health Canada and the World Health Organization have concluded that EMFs from transmission lines are not considered a health hazard and at typical exposure levels pose no known health risk. Utilities monitor EMF research and apply international and Canadian design and clearance standards.

Industry infrastructure complies with safety standards, and the industry remains committed to ongoing monitoring, research, and transparency, and to gaining public confidence on this subject.

## Wildfires

Wildfires can be ignited by transmission lines. To reduce such occurrences, utilities manage vegetation around transmission corridors, maintain equipment, and monitor events along corridors with modern technology to reduce ignition risk and comply with government regulations.

# Technology and system resiliency



## Underwater electricity transmission

Underwater electricity transmission cables or submarine power cables are specialized high-voltage lines laid along seabeds, riverbeds and lakebeds to carry electricity across bodies of water. Canada uses submarine power cables to move power from one location to another where it is impossible to build above ground infrastructure, to strengthen regional grid capabilities. The underwater infrastructure is costly but has proven reliable and resilient, as these cables are not exposed to wind and ice storms.

Submarine power cables in Canada can be found connecting Newfoundland to Nova Scotia, New Brunswick to P.E.I, and mainland British Columbia to Vancouver Island.